

# Thomas close enough to end to begin looking back

Andy Thomas is close enough to the planned end of his stay aboard the Russian space station Mir to begin to look back a little. All in all, he's pleased with what he sees.

"From a personal point of view, yes, I'm satisfied with the outcome," Thomas said. "We came up here with a fairly ambitious science program, which was primarily my responsibility during the mission, and that's been completed."

He said his fellow crew members, Commander Talgat Musabayev and Flight Engineer Nikolai Budarin, had some very ambitious space walk work, to straighten up a bent solar array and replace an engine. "They've achieved that; they've worked very hard on these tasks. So I think all in all, a great deal has been accomplished."

Thomas said he believes his mission has been a help to both Russia and the United

States in preparing for Phase 2 of the International Space Station program, assembly of the multinational research outpost.

"The whole effort has been one of learning how to work in a spirit of cooperation," he said. Even during his training in Russia, one focus was learning how to work together to achieve the training goals. Aboard Mir, "We've learned how to work together here on board."

Thomas has gained a lot of personal insights on long-duration space flight—"what's the best way to live on board; what's the best way to package food; what's the best way to do day-to-day housekeeping; what's the best way to live in a confined space for an extended period of time," and more.



In the midst of an extended period of packing up, Thomas had another loading and unloading job to help with. The Mir crew finished loading refuse in the Progress M-38 resupply ship linked to the Mir and prepared for the arrival of the Progress M-40 resupply ship, launched May 14 from the Baikonur Cosmodrome to carry food, water and supplies to Mir.

The previous Progress undocked May 15 to begin moving toward its destruction in the Earth's atmosphere.

Thomas continued to monitor large fires in Honduras and the Yucatan Peninsula. Thomas has been photo documenting Earth surface changes throughout his stay on orbit. Last week he was able to photograph the eruption of

Costa Rica's Arenal volcano.

Thomas' scientific experiments continue as he nears the end of his more than four months in orbit. They comprise 27 separate studies in advanced technology, Earth sciences, human life sciences, microgravity research, and International Space Station risk mitigation.

Earlier this month, Thomas completed the second of three phases of the Renal Stone Risk Assessment experiment. The final phase will be completed just prior to Thomas' return to Earth.

Thomas has less than three weeks left aboard the Mir Space Station. In early June, *Discovery* will dock with Mir and bring Thomas home to complete almost 1,000 days of U.S. astronaut occupancy aboard the station, including more than 26 months of continuous time on orbit.

## 'Launch Break' to feature more camera shots

JSC employees are encouraged to take another "Launch Break" for the upcoming STS-91 mission, participating in an officially recognized voluntary pause in the workday to watch the launch.

While the pause is voluntary, JSC managers are encouraged to provide breaks in meetings and other non-critical activities. Center organizations are asked to allow access to conference rooms and other locations with NASA Television.

A primary location for observing the launch will be Teague Auditorium, where the countdown and ascent will be shown on the large screen. A speaker from the Flight Director Office will provide in-person commentary during the launch and respond to questions afterward. For the first time, additional technical shots used for analysis by the mission evaluation room at KSC will be projected on a second screen, and a separate audio feed from the launch pad will be heard.

STS-91 launch is tentatively scheduled for 5:10 p.m. CDT June 2. Call the Employee Information Service at x36765 for the latest information or check the Daily Cyber Space Roundup at <http://www.jsc.nasa.gov/pao/roundup/>



NASA Photo KSC-98PC-0593

The STS-91 flight crew poses for a group portrait in the white room on the Orbiter Access Arm at Launch Complex 39A during Terminal Countdown Demonstration Test activities. From left, they are (back row) Pilot Dom Gorie; Mission Specialist Wendy Lawrence and Commander Charlie Precourt; and (front row) Mission Specialists Franklin Chang-Diaz, Valery Ryumin, with the Russian Space Agency; and Janet Kavandi.

## Mission Operations makes adjustments among key managers

JSC's Missions Operations Directorate has made a number of key personnel changes that are effective immediately.

Lee Briscoe has been appointed the directorate's chief engineer. Following several co-op tours, Briscoe joined JSC in 1965 after graduating from Texas A&M University with a degree in industrial engineering. Since then, he has held progressively responsible positions in Mission Operations and the Space Shuttle Program, including flight director; deputy manager of space shuttle operations; and most recently chief of the Flight Director Office.

Jeff Bantle has been selected to replace Briscoe as the chief of the Flight Director Office. Since joining JSC in 1984, Bantle has held progressively responsible positions in Mission Operations, including section head in the Systems Division and most recently deputy, Flight Director Office. He holds a bachelor's degree in mathematics/physics from Ripon College and a master's degree in aeronautics from George Washington University.

Milt Heflin has been named deputy chief of the Flight Director Office, replacing Bantle. Heflin's most recent assignment has been as deputy manager of the EVA Project Office. During his career with NASA, Heflin has served in numerous key positions, including recovery engineer during the Apollo, Skylab, and Apollo-Soyuz missions, flight controller and flight director for 20 shuttle flights. Heflin joined JSC in 1966, after earning a bachelor's degree in physics and mathematics from the University of Central Oklahoma.

Jack Knight has been selected as chief of the Simulator Operations and Technology Division, replacing Bob Holkan, who is retiring. Most recently, Knight was Mission Operations' chief engineer. His career with NASA began in 1965 after earning a bachelor's degree in electrical engineering from Georgia Tech. He has held progressively responsible positions in the Systems Division, including section head, branch chief, technical assistant for systems integration, deputy division chief and division chief. He also was a flight controller.

## STS-91 features search for anti-matter with powerful spectrometer

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Precourt, an Air Force colonel, has made two previous visits to Mir. This flight, he said signals "the end of one era and the beginning of another," the Phase 2, assembly, phase of the international research outpost.

For the return trip from Mir, they will be joined by Andy Thomas, who arrived on Mir with STS-89, launched Jan. 15.

The Phase 1 Program has maintaining a continuous American presence in space and developing the

procedures and hardware required for an international partnership in orbit. The program has produced priceless lessons, not only in long-duration space flight, but in the kind of international cooperation that will be required for the International Space Station.

*Discovery* also will carry the Alpha Magnetic Spectrometer investigation into space. The objectives are to search for anti-matter and dark matter in space and to study astrophysics. The investigation

makes up about half of the mission, scheduled for 10 days.

"It's the first high-energy particle physics experiment to fly on the space shuttle," Lead Flight Director Paul Dye said. "The AMS is not really designed to fly on the shuttle—it's designed to fly on the space station."

It will remain on the ISS for several years. "The flight on STS-91 is a chance for the scientists to check out the hardware, to check out their operations, see how the concept works and see what they can learn

about working in space," Dye said.

The multi-national AMS is operated largely by ground command. It is basically a large magnet that can bend and record the path of high-energy particles. Potentially, AMS can detect particles that can't be seen inside the Earth's atmosphere. AMS data will be recorded on board, and the crew can back up ground control if there is a command problem.

Several other experiments will be aboard *Discovery*, include two Get-

away Specials. The shuttle's robotic arm also will be tested with its new station-related equipment. The shuttle also will release a tracer gas into Mir's damaged Spektr module to try to pinpoint a leak. A single Spacehab module will be carried in *Discovery's* cargo bay.

The June 2 launch is scheduled for 5:09 p.m. CDT. The launch window, typically of flights to Mir, is short—seven to 10 minutes. The landing is set for the afternoon of June 12.

## Model railroad firm leaps into space age

By John Ira Petty

When Frank Angstead took an accounting job at the InterMountain Railway Co. in Longmont, Colo., 10 years ago, he hadn't given a lot of thought to the International Space Station. He thinks about it a lot now. So does his son, Ron.

The company makes model railway cars using injected plastic molding. Now they're moving into the space age, with a remarkably accurate and detailed 1:1/44 scale model of the station.

They exhibited the model in the lobby of the Teague Auditorium during the International Space Station Workshop for news media representatives May 12-14.

The display model was about 95 percent complete. It lacked only the Canadian arm, the service module (for which a control module was substituted) and a number of tiny detail parts. The finished version will be made up of about 300 parts.

"In some respects," said Ron Angstead, "you can achieve more detail in plastic injection than working by hand." CNC (computer numerically controlled) devices can produce tooling for detail as fine as .003 of an inch in that application, he said.

Both Frank and Ron Angstead, who joined the company as a production worker nine years ago and is now a vice president, are principals in the company. Its founder, toolmaker Fred Brummett, also remains a principal. Sales have grown from \$96,000 in 1989 to about \$1.2 million today.

The company's focus remains model railroad cars, in various scales and from various eras. But Frank Angstead said they see a lot of potential in the station model, which will be available soon, and models of other spacecraft that could follow.

The company got into the space model business unexpectedly. About three years ago Johnson Engineering asked if InterMountain would consider

making a station model.

Discussions continued off and on until about 18 months ago, when Johnson Engineering called to say it was ready to proceed. That company provided detailed drawings of the station, and work on the molds began.

InterMountain Railway will offer the ISS model in three versions. Museum-grade models will be completely assembled and offer great detail. The primary market will be aerospace companies. Those models will sell for between \$1,000 to \$2,000. Models for education will be partly assembled, and offer less detail. Including lesson plans, they will sell for about \$600. Kit models will be as detailed as the museum quality models, but require assembly—perhaps 10-15 hours. They'll cost \$150-\$160.

"Key to the model's success is that it will be more robust, cost less and offer more detail than hand-made models," said Frank Angstead, InterMountain's chief executive officer.



NASA Photo by Steve Candler

Frank and Ron Angstead display a museum-grade model of the International Space Station, made using computer numerically controlled injected plastic molding. The company doesn't plan to stop with the station models. It is developing plans for detailed models of the X-33 and X-38 spacecraft.